

EPIC CASE STUDY

TCF BANK STADIUM

UNIVERSITY OF MINNESOTA · MINNEAPOLIS, USA · OPENED 2009

The first collegiate or professional football stadium to earn LEED Silver. EPIC is the stormwater system inside the certification.

LEED	3.75	589
NEW CONSTRUCTION SILVER	ACRE WATERSHED	CHAMBERS
Certified by the USGBC	Stored and treated	One per 40 sq ft

EVIDENCE LEVEL

CERTIFIED · USGBC LEED-NC Silver, awarded to the stadium · two trade-press accounts · 2012 and 2016 photographic record

The landscaped plaza beside the stadium, Minneapolis, October 2016: half an acre of usable green space with the stormwater system beneath it.

PROJECT RECORD

PROJECT	TCF Bank Stadium, University of Minnesota East Bank campus, Minneapolis
OPENED	2009 · 50,000 seats · constructed by M.A. Mortenson Co.
CERTIFICATION	First collegiate or professional football stadium to earn Leadership in Energy and Environmental Design, New Construction Silver from the U.S. Green Building Council
DESIGN ENGINEERING	Rehbein Environmental Solutions Inc. (RESI), Minneapolis
INSTALLER	R&R Horn and Associates
GEOMEMBRANE	EPDM-R, 45-mil, Firestone Specialty Products
SITE	A half-acre landscaped plaza adjacent to the stadium, over a 0.54-acre underground system

THE PROBLEM

"At the stadium, space is at a premium," said Mark Apfelbacher, sustainability consultant at RESI. A 50,000-seat stadium was going up on a highly developed urban campus, and the stormwater had to be managed inside the confines of the limited usable green space that remained.

A conventional answer would have been a stormwater holding pond: land given over to infrastructure and nothing else, on a site with no land to spare.

The green space that did exist could not simply be lawn. On game days it has to carry broadcast trucks, emergency vehicles, maintenance vehicles and staging.

And the water leaving it drains to the Mississippi River.

WHAT EPIC BUILT

A multifunctional system beneath the landscaped plaza that removes the need for a holding pond altogether. It is non-pressurised and gravity-flow, relying on capillary water movement and evapotranspiration from a subsurface water supply, so it drains, treats and irrigates at the same time.

RESI excavated and prepared the watershed subsurface as a laser-level flat basin with 3:1 and 4:1 rising slopes. Approximately 100,000 sq ft of 45-mil Firestone EPDM geomembrane went down as an impervious barrier over the existing soil, in 20 ft × 100 ft panels overlapped 6 in, primed and secured with QuickSeam tape. A four-person crew completed the liner in about five days.

On top of the liner: the EPIC chambers and piping, fine aggregate, then the turf system with its sand profile, the whole covered with sod.

Above ground, ReFlex polypropylene mesh, the Netlon advanced turf system, is blended into the top 8 in of soil. It stabilises the soil, improves load-bearing capacity, reduces compaction and decreases rutting and deformation from vehicle parking. Liner and turf system were used in combination to minimise soil erosion and stabilise the slopes.



Chambers and connecting pipes installed on top of the geomembrane liner.



The plaza from above: the lawn strips between the sidewalks and the street sit over the system.

LEED
NEW CONSTRUCTION SILVER CERTIFIED BY THE USGBC

3.75
ACRE WATERSHED STORED AND TREATED

589
CHAMBERS, ONE PER 40 SQ FT

THE RECORD

Pollutant removal capability of the completed system, as stated by RESI.

POLLUTANT	STATED REMOVAL CAPABILITY
Phosphorus	more than 85%
Total suspended solids	90%
Nitrates	60%

> "The completed storm water system, according to Muellner, has the capability to remove more than 85% of phosphorous pollutants, 90% of total suspended solids and 60% of nitrates." Dave Muellner, senior project manager, RESI, in "Geomembrane Defense", Storm Water Solutions, July/August 2010.

CAPACITY AND CATCHMENT

	AS PUBLISHED	STATED IN
Drainage area	3.75 acres	Geosynthetics 2009; Storm Water Solutions 2010; EPIC site sheet
System footprint	0.54 acres, one seventh of the drainage area	Geosynthetics 2009
Chambers	589 total, one per 40 sq ft	Geosynthetics 2009
Below ground	more than 60,000 gal	Geosynthetics 2009; Storm Water Solutions 2010
Equivalent rainfall	a 0.50 in rainfall event, below ground	Geosynthetics 2009
Above ground	more than 72,000 gal	Geosynthetics 2009
Combined	more than 140,000 gal	Storm Water Solutions 2010
Rain event managed	all runoff from a 3.5 in event; over 3.50 in in 24 hours	Storm Water Solutions 2010; EPIC site sheet

> Geosynthetics 2009 gives the exact chamber count of 589 at one per 40 sq ft, and records that the 3.75-acre drainage area is seven times the 0.54-acre footprint of the system itself. Storm Water Solutions 2010 describes the same count as "nearly 600". Capacity figures are minimums.

ALSO ON THE RECORD

- **The stadium's wider sustainability result.** Potable water used for landscape irrigation was cut in half, and a 30% reduction in indoor potable water use was achieved. Alongside: 97% of the nearly 9,000 tons of steel came from recycled steel, and 98% of construction waste from the site was recycled.
  Storm Water Solutions, July/August 2010

- **Doug Lauer, landcare supervisor, University of Minnesota.** "From a sustainability standpoint, we're able to reduce our need, and related costs, for irrigation because the roots from the turf pull water up through the sand profile… We also save money by eliminating the disposal of water down the storm sewer."
  Storm Water Solutions, July/August 2010

- **And on how it came through the seasons.** "[The system] withstood the summer rains well, and there were no problems with any of the pipes throughout the winter… The turf is healthy, green and growing well, even though it gets a lot of student traffic."
  Doug Lauer, Storm Water Solutions, July/August 2010

- **The benchmark it was measured against.** Geosynthetics 2009 describes the water-treatment capability of the system as "similar to, but more effective than, sand-filter technology", and records that a major league sand filter was installed at the stadium as a prior component of the stormwater system, capable of removing up to 70 to 85% of total suspended solids and up to 35% of pathogens including coliform, streptococci and E. coli.
  Geosynthetics, February/March 2009

- **Dave Muellner, senior project manager, RESI.** "With limited space available at the stadium, this multifunctional system eliminates the need for a traditional storm water holding pond, while improving water quality… It also provides the university with an open green space that is strong enough to support heavy vehicles used by media, emergency personnel, maintenance staff and others during football games."
  Storm Water Solutions, July/August 2010



A RAINFALL OBSERVATION FROM SITE

About ten minutes after a thunderstorm. Runoff from the conventional grass in the foreground reaches the gutter; the EPIC sections beyond show none.

PUBLISHED ACCOUNTS

- **Storm Water Solutions, July/August 2010.** "Geomembrane Defense", by Chuck Pappas, chief executive officer, Rehbein Environmental Solutions Inc. © Scranton Gillette Communications, Inc., reprinted with permission.

- **Geosynthetics, February/March 2009.** By Ron Bygness, editor, and Mark Apfelbacher, sustainability consultant, Rehbein Environmental Solutions Inc. © Geosynthetics, reprinted with permission of IFAI.

Both articles expand EPIC as "Environmental Passive Integrated Chamber", the name in use at the time.



Jul 2012 **THREE YEARS AFTER OPENING**

The plaza turf.



Oct 2016 **SEVEN YEARS IN SERVICE**



Autumn 2016

The same lawn.

RECORDS EPIC site sheet for the University of Minnesota TCF Bank Stadium; Storm Water Solutions, July/August 2010; Geosynthetics, February/March 2009; site notes; dated site photographs, July 2012 and October 2016.